A Supply Chain Network Analysis of Carbon Emissions from Textile and Apparel Sectors in China

Topic:
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The apparel industry is responsible for 10% of the worldâ€™s carbon emissions, making it the second highest industrial polluter after the oil industry. Thus, Consequently, the global manufacturing industry, in its various forms, contributes to significant energy consumption and emissions, along with substantial amounts of carbon emissions.

This is due to the recent growth of fast fashion, which has led to mass production of clothing and an increase in textile waste. Clothing production has doubled since 2000, and with further spread of fast fashion, population growth, and economic development, the demand for apparel and textile products worldwide is expected to expand further, raising concerns about its impact on climate change.

Previous studies have evaluated the lifecycle impact of apparel consumption, emphasizing the importance and significance of reducing carbon emissions in this sector. However, these studies have not identified carbon emission hotspots within the global apparel supply chain. Addressing the crucial issue of greening global supply chain networks for specific carbon-intensive products, such as apparel, is imperative (see, for example, Kagawa et al., 2015).

Therefore, this research quantifies the global carbon footprint in China, the worldâ€™s largest consumer of apparel, and the contribution of each supply chain path transaction to carbon emissions. The novelty of this study is that it identifies carbon emission-intensive supply chain paths (i.e., CO2 emission hotspots) in the global apparel supply chain and provides concrete guidelines for stakeholders relevant to policy making to effectively reduce their carbon footprint.

Using the Global Multi-region Input-Output Model (Eora), we estimated the direct and indirect carbon emissions induced by final demand through standard Environment Extended Input-Output analysis (EEIOA). Furthermore, we applied Structural Path Analysis (SPA) to identify the supply chain paths with the largest contribution to domestic or foreign sector carbon emissions through China's textile and apparel sector, in other words, to pinpoint carbon emission hotspots.

The result shows that Chinaâ€™s textile and apparel sectorâ€™s final demand in 2015 contributed to approximately 400 million tons of carbon emissions, accounting for about 38% of the global carbon emissions from the apparel and textile sector. Moreover, domestic sectors accounted for about 93% of the carbon emissions attributed to China's textile and apparel sector. The supply chain paths with the largest carbon emissions were â€œTextiles and Wearing Apparel â†’ Textiles and Wearing Apparel â†’ Electricity, Gas, and Waterâ€• (13,716 kt-CO2e), â€œTextiles and Wearing Apparel â†’ Petroleum, Chemical and Non-Metallic Mineral Products â†’ Electricity, Gas, and Waterâ€• (9,923 kt-CO2e), and â€œTextile and Wearing Apparel â†’ Textile and Wearing Apparel â†’ Textile and Wearing Apparelâ€• (9,919 kt-CO2e). The carbon emissions from each of these supply chain paths exceeded those emitted by the entire textile and wearing apparel sectors of Japan and the United Kingdom.

The empirical results indicate the importance of implementing appropriate measures in the Electricity, Gas, and Water sectors, as well as the Petroleum, Chemical and Non-Metallic Mineral Products sectors, involved in supply chain paths associated with Chinaâ€™s Textile and Wearing

Apparel to reduce carbon emissions. In addition, as Textile and Wearing Apparel is highly traded within the same sector, it is necessary to reduce the number of spillovers required to meet intermediate demand, i.e., to achieve factory consolidation.

This study identifies CO2 hotspots in Chinaâ€™s textile and apparel supply chain. One of the key findings of this study is that addressing the supply chain paths caused by textile and wearing apparel in China has great potential to reduce CO2 emissions from the sector globally.